



**Europäisches Patentamt
European Patent Office
Office européen des brevets**



(11) EP 1 160 486 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
28.07.2004 Bulletin 2004/31

(51) Int Cl.7: **F16H 61/00**, B60K 23/08,
B60K 17/342

(43) Date of publication A2:
05.12.2001 Bulletin 2001/49

(21) Application number: 01112838.6

(22) Date of filing: 30.05.2001

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR

**Designated Extension States:
AL LT LV MK RO SI**

(30) Priority: 31.05.2000 JP 2000162050

(71) Applicants:
• ISUZU MOTORS LIMITED
Shinagawa-ku, Tokyo (JP)

- Tanaka, Hirohisa
Tokyo (JP)

(72) Inventors:

- Tanaka, Hirohisa
Meguro-ku, Tokyo (JP)

- Koga, Hidetaka, c/o Isuzu Motors Limited
Kanagawa (JP)

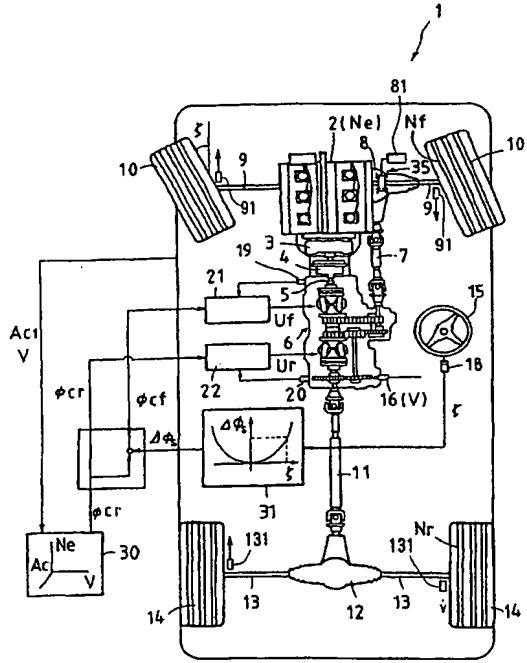
(74) Representative: Beetz & Partner Patentanwälte
Steinsdorfstrasse 10
80538 München (DE)

(54) Device for changing the speeds of the front and rear wheels in a four-wheel drive vehicle

(57) A device for changing the speeds of the front (10) and rear wheels (14) in a four-wheel-drive vehicle (1), which is equipped with a continuously variable speed-changing mechanism (6a) for the front wheels (10) which changes the input rotational speed and outputs it to the front wheel drive shafts (9) and a continuously variable speed-changing mechanism (6b) for the rear wheels (14) which changes the input rotational speed and outputs it to the rear wheel drive shafts (13). The device for changing the speeds of the front (10) and rear wheels (14) comprises a detector means for detecting the operation conditions of the vehicle (1) and a controller (30) for variably controlling the speeds of said continuously variable speed-changing mechanism for the front wheels (10) and of said continuously variable speed-changing mechanism (6b) for the rear wheels (14) based on the operation conditions of the vehicle (1) detected by said detector means. The controller (30) calculates a tire diameter ratio α of the front wheels (10) to the rear wheels (14) when the vehicle (1) travels straight, sets a target speed-changing ratio obtained based on the vehicle operation conditions detected by the detector means to be a target speed-changing ratio for the rear wheels (14) in the continuously variable speed-changing mechanism for the rear wheels (14) or to be a target speed-changing ratio for the front wheels (10) in the continuously variable speed-changing mechanism (6a) for the front wheels (10), and sets a speed-changing ratio obtained by correcting the target speed-

changing ratio based on the tire diameter ratio to be a target speed-changing ratio (ecf) for the front wheels or to be a target speed-changing (ecr) ratio for the rear wheels.

Fig. 1





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 01 11 2838

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 4 884 653 A (KOUNO KATSUMI) 5 December 1989 (1989-12-05) * column 7, line 3 - column 8, line 42; figures 1-5 *	1,5	F16H61/00 B60K23/08 B60K17/342
D,A	US 5 303 796 A (TANAKA HIROHISA ET AL) 19 April 1994 (1994-04-19) * the whole document *	1,9	
A	US 5 927 425 A (KUSANO MASAHIRO) 27 July 1999 (1999-07-27) * the whole document *	1	
A	US 5 461 568 A (MORITA KOJI) 24 October 1995 (1995-10-24) * the whole document *	1	
TECHNICAL FIELDS SEARCHED (Int.Cl.7)			
B60K F16H			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
Munich	7 June 2004	Vogt-Schilb, G	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone	T : theory or principle underlying the invention		
Y : particularly relevant if combined with another document of the same category	E : earlier patent document, but published on, or after the filing date		
A : technological background	D : document cited in the application		
O : non-written disclosure	L : document cited for other reasons		
P : intermediate document	& : member of the same patent family, corresponding document		

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 11 2838

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-06-2004

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 4884653	A	05-12-1989	JP	2508009 B2	19-06-1996
			JP	63043827 A	24-02-1988
			JP	63141832 A	14-06-1988
			US	4987967 A	29-01-1991
<hr/>					
US 5303796	A	19-04-1994	JP	5157151 A	22-06-1993
			DE	4240724 A1	09-06-1993
			GB	2263321 A ,B	21-07-1993
<hr/>					
US 5927425	A	27-07-1999	JP	3405052 B2	12-05-2003
			JP	9254674 A	30-09-1997
			DE	19711719 A1	06-11-1997
			KR	234610 B1	15-12-1999
<hr/>					
US 5461568	A	24-10-1995	JP	2768134 B2	25-06-1998
			JP	5319122 A	03-12-1993
<hr/>					